Outside The Box: Install A Wireless Network

In a world where computers and other electronic devices are too often bound by wires—power cables, printer cables, mouse cables, and so on—there's nothing quite like the freedom of a wireless network connection. Having access to a wireless network can change the way you use the computers in your home or office, giving you flexibility in where you locate computers and making it easier to add computers to the network.

Setting up a wireless network may seem daunting, but it's really quite straightforward. If you want Internet access in several rooms of the house, setting up a wireless network is a breeze compared to stringing Ethernet cables through the attic and drilling holes in the walls.

Like a wired network, a wireless one brings benefits beyond sharing an Internet connection. It will allow you to easily move files between your computers and share a single printer amongst two or more computers.

A basic wireless network needs just two things: a wireless gateway and a wireless network adapter card in each computer.

Step 1: Choose A Wireless Gateway

The heart of a wireless network is the gateway, a device that connects to your cable or DSL (Digital Subscriber Line) modem and communicates via radio with your PCs. Gateways go by many names, and although there are technical differences between those names, many products use the terms interchangeably.

If you'll be using the access point along with your cable modem or DSL connection, choose a gateway with an Ethernet port to connect to the cable modem. Popular models include the Linksys WRT54G (about $70; www.linksys.com) and the NetGear DG834G (about $130; www.netgear.com).

Some models, such as the Linksys WCG200 Cable Gateway (about $120), can replace your cable modem too. Instead of connecting the gateway to your cable modem, you plug your cable Internet line directly into the gateway. If you're renting a cable modem from your cable company, this option can save you money over time, but make sure the access point and the cable company support the same cable communication standard. (DOCSIS [Data Over Cable Service Interface Specification] is the most common.)

If you don't have a broadband connection, choose an access point with a built-in modem. It will allow your ISP's dial-up connection to be shared amongst the PCs on your network.

You also need to decide which wireless protocol you want to use. The two main choices for homes and small offices are 802.11b and 802.11g. 802.11b is a slower, older technology, so consequently the hardware is less expensive. 802.11g is about five times faster than 802.11b. Although hardware prices have fallen considerably, 802.11g hardware still costs a few dollars more than 802.11b-compatible hardware. Unless you are on a tight budget, 802.11g is worth the extra expense. It is backward-compatible with 802.11b, so that if a houseguest wants to surf the Internet using his 802.11b card, he'll be able to do so with your 802.11g network.

There is yet another protocol called 802.11a, but it is generally used in corporate networks, not in the home. Because it uses a different part of the spectrum, it isn't compatible with 802.11b or 802.11g. Access points that

support these two are available, but unless you have a special need for 802.11a in your home, the extra protocol isn't worth the extra money.

Step 2: Choose Wireless Network Adapters

You've chosen an access point, but don't check out at the computer store just yet. Each computer or other device that you want to access the wireless network will need a network adapter, the transceiver that talks to the gateway.

Many new laptop computers have one already built-in. If yours does, you won't need to add any equipment to it. If it doesn't, there are a myriad of ways to add one: Network adapters are available that plug into the computer's PC Card slot, PCI (Peripheral Component Interconnect) slot, USB (Universal Serial Bus) port, or Ethernet port.

If your notebook has a free PC Card slot, a PC Card adapter is the best way to go. Otherwise, opt for a USB adapter. For a desktop PC, a PCI adapter will provide a fast, inexpensive wireless upgrade. CompactFlash and Secure Digital adapters are available for PocketPC and PalmOS PDAs.

It isn't vital that the network adapter that you choose is the same brand as the access point. Because 802.11b and 802.11g are standards, you can mix and match hardware from different companies to create your network. You may be able to save cash by choosing the cheapest access point and network adapters without regard to brand.

An access point distributes your Internet connection wirelessly.

On the other hand, there are advantages to choosing hardware from the same manufacturer. First, the configuration software will have similar interfaces, which can make setup go more smoothly. Secondly, some manufacturers offer hardware that can transmit data much faster than the 802.11g protocol officially supports. However, these performance enhancements can only be realized when you use hardware from the same manufacturer. Linksys hardware with SpeedBooster technology can run significantly faster than standard 802.11g. Similarly, D-Link's XtremeG protocol runs twice as fast as 802.11g. But both speed-ups only work with hardware from the same company, so if you're looking for the ultimate in wireless networking speed, it pays to be loyal to one brand.

Step 3: Choose A Location For The Wireless Access Point

The location of your access point is important: It will affect the quality of the wireless network through the rest of your home.

A wireless access point can typically interact with computers in a 200- to 300-foot radius, more or less, depending on obstructions. As you move farther away from the access point, the connection will become slower. Walls and other obstructions, especially concrete and steel beams, further limit wireless range. So it's best to position the access point centrally in your home.

If you install the access point in the office on the east side of the house, the signal may not reach all the way to the living room on the west side. However, the same access point located somewhere in the middle could serve both rooms. Because it connects to your cable/DSL modem or phone line, the access point's location will be dictated by the location of cable or phone jacks. Stake out the jacks in your home and choose the one that is both central to where you want wireless access and located near a power outlet.

Step 4: Install The Gateway

Now you're ready to install the wireless gateway. The procedure will vary from product to product, so follow the instructions specific to your model.

If you have a cable or DSL modem, use an Ethernet cable (which will be included with the gateway) to connect the gateway's Internet or WAN (wide-area network) port to your cable/DSL modem's PC Ethernet port. Plug the access point into the power outlet and turn it on. Turn your cable/DSL modem off, wait a few seconds, and turn it back on: This will force the modem to recognize its connection to the new access point.

If you use a dial-up modem connection, use a standard phone cable to connect the access point's modem jack to the

phone line. You'll have to configure the access point with the phone number of your ISP, along with your account username and password. Although you're probably used to your PC's modem dialing in to connect to the Internet, from now on the access point's built-in modem will make the connection.

If the access point came with PC software, install it on the computer that you want to configure the access point from. The first time you configure it, you may have to connect the access point to the PC's Ethernet or USB port. After configuration, you can disconnect the cable and move the PC farther away for wireless access.

Step 5: Configure The Gateway

Now you need to configure the gateway. Again, read the manual to find out how. On some models, the configuration interface is accessed through your Web browser; others use special configuration software on the PC. The configuration software will walk you through the steps of setting up the wireless network.

You'll be asked to choose a channel for your wireless connection. In the United States, 11 wireless channels are available. In isolated areas without many other wireless networks nearby, it doesn't matter much which channel you use. But in an office building or apartment with a lot of other wireless activity, there may be more interference on one channel than another. Cordless phones, baby monitors, and microwave ovens can create interference, so if your wireless connection seems slow or unreliable later, try changing the channel.

One of the steps will ask if you want to use DHCP (Dynamic Host Configuration Protocol), which makes network management easier by letting the access point dole out IP (Internet Protocol) addresses, domain name server information, and other network information to the computers on the LAN (local-area network). This allows the networking details to be managed from a central point. If your ISP's domain name server needs to be changed, for instance, the router will feed the new information to each computer so you won't have to update the network settings on each PC manually. In a home environment with even a couple of networked PCs, DHCP can make life much easier.

This Linksys wireless adapter fits in the PC Card slot of a notebook or PDA.

The access point does another important job: It is also a firewall. A firewall isolates your PC from incoming connections by unauthorized computers on the Internet—such as crackers and your service providers' other customers—while still allowing you to access the Internet. For users with a cable modem or DSL connection, it is essential to enable your access point's firewall function. The firewall is typically enabled by default; be sure to leave it activated.

A firewall can conflict with certain software on your PC, preventing it from accessing the Internet. This is common with networked games, file-sharing applications such as BitTorrent (www.bittorrent.com), and servers. If the firewall blocks your legitimate traffic, you can configure the gateway to allow incoming traffic for specific applications on specific PCs. Don't disable the firewall entirely.

Step 6: Choose Wireless Security

Because wireless networking transmits your information over radio waves, anyone within range of your hardware's antennas could snoop on your network. Don't worry, though. Every access point includes encryption protocols that can keep your private data private. However, encryption is usually disabled by default and the vast majority of access point owners don't bother to turn it on.

That means, potentially, a nosy neighbor could use his PC to surf the Web using your Internet connection, read the private email that you send and receive, monitor the Web sites that you visit, snoop around the files on your computer, or send spam from your network. It seems that most people don't understand these risks, so they don't bother to turn on their access point's encryption.

That said, some people do intentionally leave their wireless networks unencrypted in order to share Internet access with nearby neighbors and passersby. It can be a friendly gesture, but anyone who intentionally leaves her network unencrypted needs to take strong precautions to protect the files on her computers, keep email private, and so on. Unless you're committed to learning how to batten down the hatches on your PCs, protect yourself by enabling encryption.

Two types of encryption can protect the data on your wireless network. The older system, WEP (Wireless Encryption Protocol), is supported by all wireless equipment. A newer system, WPA (Wireless Protected Access), is available on more recently released hardware. WPA provides stronger encryption: If all of your hardware and operating systems support it, use it. If your access point or any of your network adapters don't support WPA, use WEP instead. WEP doesn't provide total security, but it is good enough to keep out casual snoops.

All of your wireless hardware needs to support the encryption protocol that you

choose, so if you have one older wireless card that doesn't do WPA, all of your equipment will need to use WEP. However, a firmware upgrade (see below) could add WPA encryption to an access point that doesn't have it now.

The procedure for enabling encryption varies from product to product, so follow the manufacturer's instructions. You'll find a security menu in the access point's configuration software. Generally, you'll pick or be assigned a password in the access point software. The password may be a long series of hex digits, such as something like 35BBD4F1C73CFC40A42382077C. Later, you will need to enter that password in the wireless security configuration window of each PC.

Add this tiny USB adapter for 802.11b access, which is the slower of two industry standards, to any notebook or desktop PC. Until you can upgrade to 802.11g, it will work just fine.

Step 7: Install & Configure The Network Adapters

Now that the access point is humming, it's time to get each of your notebooks and desktop PCs on the wireless network. You might have just one PC or a whole gaggle of them: Either way, every machine that you want to use away from the access point needs a wireless card. You should have no problem installing wireless access on any version of Windows, from Windows 95 though Windows XP. You're not limited to just Windows: Computers running Linux, Mac OS, and other operating systems can be members of your network, too.

It's a good idea to install and configure network adapters one at a time. Get one computer online before moving on to the next machine.

The installation procedure is different from product to product, so read the manual for each network adapter. The usual procedure is to install the software for the adapter and then install the card itself. For USB and PC Card adapters, this simply means plugging in the card. If you'll be installing a PCI card on a desktop PC, you need to unplug the computer, remove the side panel, and install the card into an empty PCI slot. It's a simple process that will take five to 10 minutes.

If a computer is permanently located in the same room as your access point, it doesn't need a wireless card. Most access points offer bridging functionality, which means they can connect two networks—in this case, the wireless network and a wired one. So you can connect a computer (or several—usually up to four, depending on the access point) to the access point with an Ethernet cable. The advantage is that an Ethernet cable costs only a couple of dollars, compared to $30 or more for a wireless card. Mixing wired and wireless devices can be a convenient way to build a network.

Step 8: Upgrade The Access Point's Firmware

Chances are the access point you just bought was sitting on a store or warehouse shelf for some time, so it's possible that the manufacturer released a new version of the access point's firmware during that time. Now is a good time to check for a firmware upgrade and, if there is one, install it.

Firmware is the software that's built into hardware, like any software, you can upgrade it. Manufacturers release firmware upgrades to patch security holes, increase compatibility with other products, and add features.

Look at the status page of the access point's configuration interface to find out what firmware version it is currently running. Then check the manufacturer's Web site to see if a newer version is available.

If there is, follow the manual's directions to upgrade it. This is usually simply a matter of downloading a file to the PC and then running it. The program will write the new firmware to the access point's permanent memory. The program may take several minutes to do the job. Do not turn off the computer or access point until the program says that the new firmware is installed. Interrupting the process could leave your access point comatose, with partially installed firmware. When the firmware upgrade is done, you can delete the installer program from the PC.

Step 9: Enjoy Your Wireless Internet Connection

Now that the network and each computer are configured, enjoy your fast, wireless Internet connection. Roam with the notebook from room to room as you read your favorite blogs or send files effortlessly from one PC to another.

Step 10: Consider Connecting Other Devices

You also might want to consider ways you can expand your network; it doesn't have to be limited to computers. You can add your Sony PlayStation 2 or Xbox to the wireless network, which will let the kids (and you) play networked games without having an Ethernet wire trip-hazard running from the computer room to the living room.

Just connect an Ethernet-to-wireless bridge, such as the Linksys WET54G Wireless-G Ethernet Bridge (about $140) or D-Link DWL-G810 (about $90) to

your game console's Ethernet port. The console will see that it's connected to a network and let you play. It won't know or care that it's not a wired network.

In the same way, you can add any other device with an Ethernet port to your wireless network. If there's a printer taking up space on your desk (marooned there because it's within a cable's reach of your PC) you could move that printer virtually anywhere—to a closet, perhaps—as long as there's a power source in the new location. As a bonus, you may be able to share that printer with every computer on the network, so you can print from the notebook and the PC in the kids' room.

Many digital video recorders, such as Series 2 TiVo and ReplayTV, can download program guide information over the wireless connection instead of over the phone. TiVo officially recommends using the Linksys WUSB11 adapter (about $40) for this, although other adapters may work.

Step 11: Expand The Reach Of Your Network

If you find that your access point doesn't reach the far-flung nooks and crannies of your home, there are a number of ways to expand the reach of your wireless network. You don't need to live in a mansion to have this problem: Too many walls can prevent the signal from reaching the den, or you may want Internet access out on the porch.

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If your access point has an external antenna jack, attaching a new antenna to it can boost its signal. Built-in antennas are typically adequate, but an add-on antenna can boost the power by double or more. Aftermarket antennas are available from HyperLink (www.hyperlinktech.com); Fleeman, Anderson & Bird (www.fab-corp.com); and other companies.

But there's a problem, a super-powerful antenna on the access point may make its signal reach the next city, but your notebook's little antenna isn't powerful enough to transmit its signal back. For regular use around the house, a better solution could be to add a wireless bridge, which is a second wireless access point that retransmits everything it receives back to the main access point, thus expanding the range of wireless access in your home. The bridge doesn't need to be connected to a cable/DSL modem—all it needs is power.

Bridging isn't limited to just two access points: You can create a complex network of bridges that cover a large area. Many bridges use a technology called WDS (Wireless Distribution System). The WDS implementation from one manufacturer may not be compatible with another manufacturer's version, so choose a bridge from the same company that made your main access point.

There is a downside to bridging. The extra "hop" it takes for your data to be received and retransmitted by the bridge adds to the latency of your network connection, so your data will move a bit more slowly.

Yet another option is to run an Ethernet cable from the main access point to a bridge located in the far-flung section of the house. Although this means stringing a wire through the attic or other equally inaccessible areas (something you were trying to avoid, right?) it can allow you to place a bridge that isn't within radio range of the main access point. So, you could have the access point at the east side of the house and a bridge at the west: Together they will cover the whole house and the patio, too. There's no additional latency as there is with the wireless bridge. PCT

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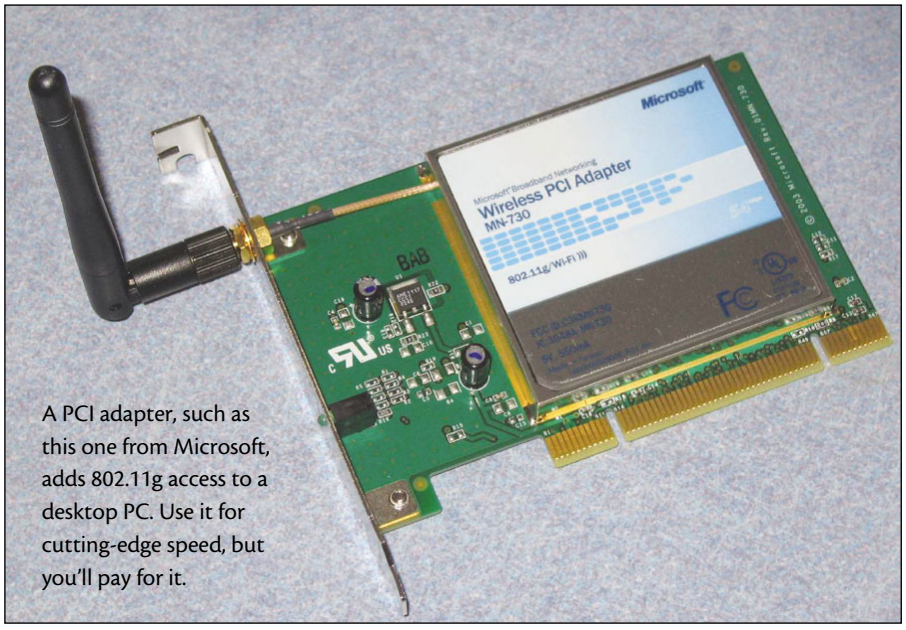

A PCI adapter, such as this one from Microsoft, adds 802.11g access to a desktop PC. Use it for cutting-edge speed, but you'll pay for it.